DOCUMENT RESUME

ED 264 051 RC 015 480

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TITLE Rural Science Education: A Model for Improvement.
INSTITUTION Kansas State Univ., Manhattan. Coll. of Education.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE Oct 85
NOTE 35p.; Paper presented at the Conference of the National Rural Education Association (77th, Cedar Rapids, IA, October 12-15, 1985).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Change Strategies; Educational Needs; Elementary School Science; Elementary Secondary Education; Improvement Programs; *Inservice Teacher Education; Instructional Improvement; *Leadership Training; Professional Continuing Education; Program Descriptions; Program Implementation; *Rural Education; Rural Schools; Science Instruction; *Science Teachers; Summer Science Programs; *Teacher Improvement; Teacher Role
IDENTIFIERS *Kansas

ABSTRACT

To meet the need for improved science instruction in rural schools, a project to identify, honor, and provide training for outstanding rural science teachers in grades 6-9 was designed cooperatively by the National Science Foundation, Kansas State University, Kansas Cosmosphere and Discovery Center, and rural school districts. In order to create a pool of excellent teachers with the ability and skills to help other rural science teachers, the project provided training in science content, methodology, leadership, and staff development. Participants were selected from 141 districts in rural Kansas. Instructional activities were conducted during a 2-week summer period. One week--spent at the Cosmosphere--focused on space science and technology, and 1 week--spent at Kansas State University--focused on science education and staff development. This paper includes discussion of project evaluation and follow-up activities planned or underway. A summary of project needs, objectives, and activities is provided along with criteria for participant selection. Appendices contain a needs assessment survey conducted with participants, participant application form, and guidelines for an action plan that each participant developed to implement changes in science instruction at the local level. The 4-step plan covers evaluating science teaching situations, school and district organization, evaluating proposed changes, and factors in implementing change. (JHZ)

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# Rural Science Education: A Model for Improvement

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Project Funded By the National Science Foundation

Paper presented at the REA National Convention,
Cedar Rapids, Iowa, October 13-15, 1985

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## Introduction

"Let's get together after school and talk about science." This remark might be typical in urban or suburban large school districts. Science coordinators or department chairpersons often hold such meetings to compare notes or look at new materials. However, in Zook or Agra, Kansas, this type of meeting is virtually impossible. One or two science teachers make up the entire staff in many rural Kansas schools. In a recent conversation with some rural teachers, the following comment was overheard: "If I want to go to a movie, I have to drive 80 miles one-way and then I only have one choice!" This comment brings to focus a common problem for rural educators, that of isolation. Science teachers in the rural setting lack the availability of colleagues for collaboration on the issues relevant to their teaching area. There is a need for some mechanism to facilitate regional collaboration through inservice and other training methods. However, if we are to propose such action it is essential that qualified science teachers be involved at the local and regional levels. These teachers should be highly competent both in science content and methodology and the area of leadership and staff development. Teachers possessing these characteristics are not common. However, outstanding science teachers are present on the Kansas rural scene and could be identified and trained in these areas.

Several programs encouraging the use of teachers in staff renewal are in place. The Vermont Consulting Teacher Program, the Lincoln (Nebraska) Public Schools Helping Teacher Cadre, the Portal School Project in Wyoming are examples. There is a potentially powerful pool of resources for helping individual science teachers solve instructional problems -- other teachers. With additional training in the areas of science and methodology and the introduction of training in the area of staff development, outstanding science

teachers can become this powerful resource in the rural areas of Kansas as local or regional facilitators. Excellence in teaching can be multiplied.

The participants selected as the population for this project were drawn from 141 school districts in rural Kansas. These districts are located in areas outside the sphere of influence of cities over 100,000 in population, and have less than 600 students K-12. Eighty percent of the State of Kansas is outside such a sphere of influence. Rural Kansas has numerous homogeneous characteristics in terms of physical, economical, cultural, ad educatioal environment. Farming, grazing of livestock, localized oil production, and light local industry form the economic base for the area.

The purpose of this project was to identify, honor, and provide training for outstanding rural science teachers in order to create a pool of excellence in teaching with the ability and skills to help other rural science teachers. This endeavor called for the future development of activities designed to disseminate materials and information and to provide cooprative staff development and enrichment programs. Such potential "payoffs" were predicated on the development of the project to provide a pool of excellent teachers of science.

## Needs

The shortage of qualified science teachers in our schools is well documented. In the testimony to the Committee on Labor and Human Resources of the U.S. Senate by the National Science Teachers Association (April 15, 1982), a 65% decline in science teachers was reported for the ten-year period 1971-1980 based on a survey of 600 colleges and universities. In addition, it was also

reported that of those trained to teach science, an increasing number choose business or industry instead. The testimony revealed that for the same period, almost five times more science and mathematics teachers left teaching for employment in non-teaching jobs than for retirement. It is reasonable to assume that many of these teachers leaving the profession were good to outstanding. Considering the emphasis on excellence as can be deomonstrated by the Presidential Awards for Excellence in Science and Mathematics Teaching Project currently being conducted by the National Science Foundation (NSF) and the National Science Teachers Assocation (NSTA), it is critical that we provide positive reward for those science teachers that are outstanding before they too leave the profession. One way to provide such rewards is to identify and honor such teachers.

With such a shortage of outstanding science teachers and the need for excellence in mind, it is critical to not only retain outstanding teachers but also to provide these teachers with additional training in the areas of science, education, and leadership so as to further develop and enhance the possibilities for excellence in their colleagues. It is becoming increasingly difficult to hire new teachers in the area of science that are highly qualified to teach basic, much less advanced courses in science. In many schools, inservice staff development programs are the only hope to turn these trends around. Critical to these programs for training are outstanding staff members that are highly competent and well trained in curriculum and leadership skills.

Junior high and middle school teachers of science historically have had less emphasis placed on their competency in the sciences and more emphasis placed on their ability to cope with the rapid development of the students at this age. With the decline in secondary science enrollment, it seems important

to develop more and better qualified middle/junior high school science teachers that can both better prepare students in science and increase student interest in science.

In the rural school setting, in addition to having the previously mentioned needs, the rural science teacher has needs in the area of science teaching that are different from larger schools in close proximity to larger population centers. There is a tendency for small schools to adopt the same programs in science, to be implemented in the same way as larger schools, without regard for the differences in the children's rural life experiences. Rural science teachers are frequently isolated from their peers and have difficulty in traveling long distances to professional meetings, thus, making it difficult to exchange ideas in their field. In addition, rural schools are usually composed of sound "generalist-type" teachers who offer strength on the one hand, but weakness on the other. These teachers often have to function in more areas than their larger school counterparts, and this sometimes results in inappropiate assignments. This is particularly true in sciences where teachers sometimes are working outside their fields of strength.[1] With this in mind, it is very important that we identify, honor, and train those outstanding science teachers that exist in this setting and bring them in contact with colleagues in order to strengthen the overall science program.

Finally, NSF studies indicate that the very best students still learn as much science as they ever did, but the rest, according to Alphonse Buccino, drop science early to avoid the tedium of courses taught by teachers who they do not

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[1] O'Neal, L. and Beckner, W. "Rural Education: Past and Present, (Part II). The Rural Educator, Vol. 3, No. 2, Winter, 1981, 17-27.

understand. Yet, according to Roger Rapoport, "Many science educators find it interesting that this new threat comes when student attendance at science museums is setting records."[2] This paradox was resolved by selecting and training science teachers in a setting that had been shown to be effective in drawing student interest and participation, namely a science museum. The Kansas Cosmosphere and Discovery Center in Hutchinson, Kansas is quickly becoming known as one of America's potentially outstanding new space science centers (museum). The strength of this setting in the area of space science was the Cosmosphere's enormous resources in equipment, artifacts, and manned space exploration exhibits. In additon, the staff's expertise in the development of space science displays was used to train teachers. Clearly, there is a need for rural science to update their training in the rapidly moving area of space science and technolgy. The Cosmosphere greatly facilitated such training in that it repesented a unique educational opportunity to teachers in rural Kansas.

## Objectives

This Project represented a cooperative effort between NSF, Kansas State University, Kansas Cosmosphere and Discovery Center, and local school districts. To guide this effort, the following objectives were formulated:

1. To identify and honor excellence in science teaching.
2. To provide additional skills and competencies in the areas of space science and technology.

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[2] Rapoport, R. "Why Johnny Hates Science." Science 81, October, 1981, 36-39

3. To provide additional skills and competencies in the area of science education.
4. To provide the expertise needed to prepare classroom and/or building level science displays and learning centers.
5. To provide additional skills and competencies needed to become leaders and change agents in the participant's local region.
6. To provide a mechanism for gathering feedback from practicing participants and sharing this feedback with the other participants.

In addition to the above objectives, the potential direct impact was derived by estimating that 16 middle/junior high school science teachers will teach an average of five classes per day to an average of 15 students.

## Project Activities and Timelines

The project consisted of a series of instructional activities (Figure "A") conducted during a two-week summer period on the Kansas State University campus and at the Kansas Cosmosphere in Hutchinson. Workshop planning took place in conjunction with the cadre and project staff. Included in the planning was a needs assessment conducted by mail prior to the planning sesion. A project specific needs assessment was developed by the project director for this purpose. Needs were assessed in the areas of science content, science education, and staff development (Appendix "A"). The type of delivery and content was planned and coordinated during a cadre meeting prior to the two week-session under the direction of the Project Director.

The exact content, therefore, emerged during the cadre meeting and subsequent preparation will be made by the consultant. The advantage for this type of planning was to allow contemporary issues and topics to be included. In addition, this procedure allowed a certain amount of academic freedom to each consultant.

The project consisted of two one-week sessions. The first week was conducted at the KCDC in Hutchinson and consisted of activities centered around science content, primarily dealing with space science and technology. The second session was conducted on the campus of KSU and consisted of activities dealing with science education and staff development.

Figure "A"

Instructional Activities

Science Content

A. Life Science - space travel, life support systems, biological limitations of space travel, space related biological advancements, etc.

B. Earth Science - earth resources inventory, Landsat, remote sensing, lunar geology, etc.

C. Space Science - space flight mechanics, astronomy, rocketry, history of space flight, etc.

Science Education

A. What Research Says - recent findings

B. Microcomputer Applications - interfacing science experiments with computers

C. Science Learning Centers - development of learning activities

D. Curriculum - state of the art curriculum review.

Staff Development

A. Evaluation Techniques - formative and summative

B. Inservice Design and Planning - review and introduction of models

C. Implementation-Adoption - Concerns Based Adoptton Model

D. Change Literature

Post-institute planning will be conducted to coordinate future activities in light of recent feedback. Visitations to each participant's teaching setting will be made twice during the project time period for purposes of collecting emerging feedback in the areas of content, teaching, and their leadership role. The final stage of the project will be to bring all participants together following a year of practice for a refocusing session. This sesion is intended for participant sharing and idea generating. The product of the refocusing session will be in the form of a monograph which should provide NSF, science education experts, and practicing science teachers with the practical views of outstanding service teachers.

## Summary of Needs, Objectives, and Activities

This project is designed to provide congruency between the needs, both societal and educational; the objectives, as set forth earlier; and the proposed activities. The ultimate success or failure of the project can be assessed by the level of congruency. Figure "B" provides a summary of the needs, objectives, and activities.

FIGURE "B"
Summary of Project Needs, Objectives, and Activities

| Needs | Objectives | Activities |
|---|---|---|
| 1. Excellent science teachers need to be rewarded so that they stay in teaching. | 1. To identify and honor excellence in science teaching. | 1. Select outstanding middle/junior high school science teachers based on established criteria. |
| 2. Science teachers need to gain a high level of competence in science. | 2. To provide additional skills and competencies in the areas of biology, chemistry, geology, physics, and technology. | 2. Deliver, during a two-week on-campus experience, current science topics designed to update the participant's prior training (biology, chemistry, geology, physics and technology). |
| 3. Science teachers need to gain a high level of competence in science education (i.e. methodology, curriculum, etc.). | 3. To provide additional skills and competencies in the areas of methodology, curriculum, current research, and similar science education topics. | 3. Deliver, during a two-week on-campus experience, current science education topics designed to update participant's ability to teach science. |
| 4. Science teachers need to gain the skills necessary to prepare displays and learning center needed to create science awareness and learning. | 4. To provide the expertise needed to prepare classroom and/or building level science displays and learning centers. | 4. Deliver, during the experience at the Cosmosphere, hands-on activities designed to train participants to prepare science learning centers. |
| 5. Science teachers need to gain skills and competencies necessary to become leaders and change agents. | 5. To provide additional skills and competencies needed to become leaders and change agents in the participant's local region. | 5. Deliver, during a two-week on-campus experience, staff development training in order to provide future assistance in training teachers in rural areas. |
| 6. Rural science teachers need to have some mechanism for reducing the effects of isolation. | 6. To provide a mechanism for gathering feedback from practicing participants and sharing this feedback with the other participants. | 6. Provide two weeks of training and interaction in areas pertinent to science teachers and subsequent site visitations and refocusing for collaboration. |

## Procedure for Participant Selection

Outstanding teachers of school science were selected from a pool of candidates using the following criteria and process:

Criteria:

1. Must be certified to teach science.
2. Must be teaching in a rural school as defined by: a) fewer than 600 students K-12; b) more than 50 miles from a metropolitan area with a population greater than 100,000.
3. Must teach at least one middle/junior high school science class, i.e., grades 6-9.
4. Must have administrative commitment to support participation through release time (2 days) and subsequent staff development and curriculum improvement.
5. Must show evidence of continuing education activities.
6. Will demonstrate through teaching experiences, professional activities, community involvement and other relevant activities, a keen interest in science teaching.
7. Will demonstrate, in writing, the ability to identify and analyze a problem that affects the teaching of science.
8. Provide letters of support (optional). May be from colleagues, students, administrators, parents, etc.

Selection was made by a committee consisting of two science educators, one administrator, and two scientists. The potential participant completed the Personal Data Form included in Appendix "B". Committee members used the following checklist to finalize the selection.

## Checklist

| | | |
|---|---|---|
| 1. Rural teacher. | _____Yes | _____No |
| 2. Appropriate grade level and science assignment. | _____Yes | _____No |
| 3. Has administrative commitment. | _____Yes | _____No |
| 4. Is certified. | _____Yes | _____No |
| 5. Evidence of Continuing Education | _____Yes | _____No |
| 6. Interest in science teaching as demonstrated by activities and involvement. | _____Yes | _____No |
| 7. Ability to identify and analyze problems that affects science teaching. | _____Yes | _____No |
| 8. Supporting letters. | _____Yes | _____No |

Following the careful study to the participant pool members, the top 16 were selected and offered an opportunity to participate. Every effort to insure equity in geographic distribution was made where possible.

## Project Evaluation

The evaluation procedures for the project must be flexible and responsive. They must evolve and be modified as the evaluation component interacts with the teachers and other key decision makers. The evaluation activities for the project include a wide variety of methodologies and procedures. The events which are central to the project's effectiveness, as outlined in the project description, require evaluation strategies appropriate for each activity, both quantitative and qualitative. Evaluation procedures and methods are designed to portray the events in a meaningful manner, meet the needs of the project, and serve to continually turnover the project's operation. It was suggested that

the evaluation plan be composed of both formative and summative phases. The formative phase, which includes needs assessment, resource identification, and planning, is concerned with appraising the degree to which each project component is operational and achieving its desired objectives. The summative phase will take place at, or near, the termination of the project. The proposed evaluation plan will provide much more than terminal evaluation. It will supply data showing whether or not the project is succeeding, and if the project is not succeeding the data will help clarify why this is so at a time when needed alternations can still be made.

Evaluation Design:

The general strategy for the evaluation of this project involves the ethnographic or naturalistic approach. The components of this process consisted of: 1) needs assessment; 2) concerns of the participants; 3) demographic characteristics of the schools; 4) teacher characteristics and action planning. Assessment of these components consisted of self-reporting instruments (needs assessment, stages of concern and demographics), open-ended interviews (teacher characteristics) and teacher generated action plans. The stages of concerns instrument and the Action Plan Guide are included in Appendix "C". At this time, much of the data are still being processed.

Critical to any proposed change in a school program is proactive stance by the teacher. In this project the individual action plan, unique for each teacher, represents this stance. An example of an action plan from one of the rural science teachers in included as Appendix "D".

Tangible Payoffs:

Emerging from this project will be the possibility of the following scenarios:

- The participant science teacher spends a day in another school to help solve specific problems in that setting.
- Other science teachers are allowed to visit the participant science teacher for collaboration on ideas concerning content and methodology.
- The participant science teacher conducts regional workshops sponsored by participating schools.
- The participant science teacher coordinates efforts in the local region to bring in facilitators from the university, government, and the private sector.
- The participant science teacher trains other outstanding science teachers in staff development skills to further multiply the effect of the project.

The immediate real payoff will be to impact over 280 students with high quality science instruction.

# APPENDICES

APPENDIX "A"

NEEDS ASSESSMENT

NAME: _____ USD # _____

## NEEDS ASSESSMENT SURVEY

In an effort to incorporate your needs into our workshop planning, we are requesting that you complete the following survey. Many of these topics have been included based on the opinions you, as a group, have expressed in your applications. At this point, we need further clarification and group response to these topics. Please feel free to add or comment upon any topics you are interested in. Please complete and return these surveys as soon as possible to enable us to proceed with our planning.

Thank you for your time.

Please respond to each item below as to your opinion of the item as a workshop topic:

| SCIENCE | NOT NEEDED | WOULD HELP ME | VERY IMPORTANT |
|---|---|---|---|
| 1. Current research in science | ____ | ____ | ____ |
| 2. Research findings in science | ____ | ____ | ____ |
| 3. New ideas for student research in the classroom | ____ | ____ | ____ |
| 4. Classroom application of current topics in science | ____ | ____ | ____ |
| **SCIENCE EDUCATION** | | | |
| 5. Recent findings on science teaching effectiveness (curriculum, methods, etc.) | ____ | ____ | ____ |
| 6. Microcomputer application in the classroom | ____ | ____ | ____ |
| 7. New curriculum materials in science education | ____ | ____ | ____ |
| 8. Varied approached for teaching science education | ____ | ____ | ____ |
| 9. Current media and their application to science teaching (films, slides, T.V., etc.) | ____ | ____ | ____ |
| 10. Criteria for evaluation of science methods and materials | ____ | ____ | ____ |

Please add any topics you would like to have presented and any comments.

_____

_____

_____

_____

_____

Please answer the following questions:

STAFF DEVELOPMENT

| | YES | NO |
|---|---|---|
| 11. Do you see a need for improvement of science education in your district? | ____ | ____ |
| 12. Would you like to be involved in an effort to improve science education in your district? | ____ | ____ |
| 13. Are you familiar with current concepts on: | | |
| a. Staff Development | ____ | ____ |
| b. Implementation | ____ | ____ |
| c. School Change | ____ | ____ |

Please check any of the following items which you see as an area of need in your district.

| | YES | NO |
|---|---|---|
| 1. Too little time devoted to science instruction | ____ | ____ |
| 2. Difficulty of science as a subject matter | ____ | ____ |
| 3. Poor attitude of teachers towards science | ____ | ____ |
| 4. Poor attitude of students towards science | ____ | ____ |
| 5. Lack of coordination of K-12 science program | ____ | ____ |
| 6. Lack of science education facilities | ____ | ____ |
| 7. Lack of science education materials | ____ | ____ |
| 8. Lack of contact with other science teachers | ____ | ____ |
| 9. Keeping up with current trends in science | ____ | ____ |
| 10. Meeting wide range of student abilities within each classroom | ____ | ____ |
| 11. Diversity of subject area assignments in science education | ____ | ____ |
| 12. Lack of access to community resources (people, places) | ____ | ____ |
| 13. Lack of relevancy of science to students lives | ____ | ____ |
| 14. OTHER: | ____ | ____ |

_____

_____

_____

_____

_____

APPENDIX "B"

Personal Data Form

PERSONAL DATA FORM

NAME: _____

SCHOOL: _____ USD # _____

SCHOOL ADDRESS: _____

_____

(city)_____ (zip) _____

CIRCLE TEACHING LEVEL:

Currently: 6 7 8 9 10 11 12

In past: 6 7 8 9 10 11 12

If you were to be selected as an outstanding science teacher and thus became a participant in this project, give below the name, etc., of the administrator in your school who would be empowered to support your participation by way of release time (one day) and possible curriculum development:

NAME: _____

TITLE: _____

SCHOOL ADDRESS: _____

_____

(city) _____ (zip) _____

Use separate sheets of paper to answer the following questions or to provide the information called for:

1. Background and Experience
   a. Formal Education: postsecondary programs resulting in a degree or intended to result in a degree. Give institution, location, type of degree awarded, major dates in which degree granted. (If program not yet completed, list courses completed to date.)
   b. Continuing Education Activities: Give dates taken, institution, nature of activity or course. Include anything that would fall appropriately under the heading of staff development or personal development and that, directly or indirectly, would result in a more effective teacher.
   c. Teaching Experience: School, teaching assignment, dates, and any other related information you feel would give a more vivid picture of your teaching career. (Include employment other than teaching).
   d. Professional Activities.
   e. Community Involvement.
   f. Special Youth Activities.
   g. Special Hobbies, Travel, Research Interests, Work in Industry, etc.
2. Identify a critical problem that affects the teaching of science or mathematics in your school district and discuss what might be done about this problem(s) (2 pages, typed, double spaced).
3. Append a maximum of four letters of support (each one page only). Such letters are optional. Letters may be from colleagues, students or former students, a supervisor/administrator, or parents of a present or former student.

APPENDIX "C"

Stages of Concern
Questionnaire
and
Action Plan Guide

The Stages of Concern Questionnaire is copyrighted and has been removed (pp. 23-26).

## Action Plan

An action plan is not only a product, but a process for analyzing where you are in your teaching career and where you would like to be. It is a process of assessing your personal, school or district strengths and weaknesses and determining which practices should be continued and which should be changed. It is also a process of deciding what your specific role is in this change effort. Ultimately, it is a process of making some decisions about your involvement in school improvement. In developing an action plan, the following outlined factors should be considered:

I. Background and Assessment of Current Professional Assignment
II. Organizational Content
III. Analysis of the Proposed Change or Innovation
IV. Implementation Plan

The following pages will describe the factors to consider under each outline topic and include specific questions to address in your Action Plan. The meaning and importance of these factors will be explained in the sessions during this week.

I. Background and Assessment of Current Professional Assignment

A. Location and General Background
B. Current Instructional Procedures
C. Personal Assessment of Teaching

You should begin your plan by providing the reader with the basic information about your present position. This includes your school district, grade level, type of classroom organization and curricular area. Describe the general instructional strategies which you employ in your classroom. Explain "what" you teach and "how" you teach and include related information such as textbook, supplementary reading, curriculum guide and other teaching materials. Describe your educational philosophy or your purpose in teaching. How is this purpose reflected in what and how you teach? A short description of your training and experience should be included. Based on your training and experience, what do you feel are your professional strengths and weaknesses?

II. Organizational Content

A. Structure
B. Decision Making
C. People
D. Influences
E. Organizational Assessment

This section of your plan should provide the reader with a better understanding of your school and district as an organization. Discuss the location and environment of your school district. What community factors influence education in your area? How isolated or autonomous is your school? Describe your images of your organization and its social structure. Are you a tight or loosely knit group? What are your institutional characteristics and perspectives? What does your organization see as its purpose and function? Include any social or historical factors that are a part of the organizational perspective. Describe how decisions are made in your school and district and by whom. What is the nature of these decisions? How much control is there over what happens in your class? What school or district policies are reflected in your teaching? Describe the people in your organization. What is the social climate of your school? How collaborative and supportive are people of one another? What will any school change mean to these people? How will they react? Discuss any internal or external influences that have an affect on your school or district. Keeping in mind all of these factors and what you know about affective schools and rural education, what do you consider to be the strengths and weaknesses of your organization?

III. Analysis of the Proposed Change or Innovation

A. Description and Foundational Values
B. Needs Addressed, Beneficiaries and Priorities
C. Practicality of the Proposal

Based upon experiences and readings undertaken in this course and upon your assessment of personal and organizational strengths and weaknesses, discuss any changes which you are willing to implement in your instructional setting. What new content, strategies, materials or activities would you like to include in your teaching? Are you interested in taking on a leadership role in terms of school or district improvement of science education? What role would this be? Describe the values that are involved in the changes you would like to make. What needs are being addressed? Who will benefit from your proposal? Who or what will be neglected? How much of a priority is the aera of change addressed and for whom? Describe the practicality of your plan. How achievable is the change? How clear and workable are your ideas? Are they of good quality? Are they too complex or difficult? Do they fit with your teaching style and educational philosophy? Do they make the most of your personal, organizational and rural strengths, while avoiding the limitations? What is the extent of the proposed change? Is it significantly different from current practices to warrent its effort? What are the anticipated personal and professional costs of implementing your ideas? Do the benefits outweigh the costs?

IV. Implementation Plan

A. Factors to consider
B. Participation
C. Resources
D. Evaluation
E. Staff Development
F. Time Line

The final step in your action plan is to consider all the factors that will enable you to successfully implement your desired changes into your instructional setting. These can be personal, organizational, or community factors or simply aspects of the innovation which need special consideration. Think about the roles of the "actors" in your plan. Who will be involved and in what way? What are the roles and activities of the central administration, the community, the board of education, your principal and fellow teachers. In what ways will you gain their support and involvement? What special resources are available to use? What kind of outside assistance will you need? What staff development activities do you need to plan for? How will you evaluate your innovation effort? After considering all of these factors, plan a time-line for yourself. Remember to plan for adequate time. Change is a slow and detailed process.

APPENDIX "D"

Sample Action Plan

Action Plan

I. Background and Assessment of Current Professional Assignment
   A. Location and general background
      1. School District # - semi arid farming and gas industry community.
      2. Grade levels taught 9-12
      3. Classroom organization
         a. Physical Science - 9th grade - lecture format with text reinforcement, use of inquiry labs, demonstrations, computer activities, 1 major field trip, videos and films approximately 2-3 per month. Lecture to lab ratio 5:2, written text and workbook assignments, current science & other magazines - self generated tests - text, Modern Physical Science.
         b. Biology - 10th grade - lecture with lab format: ratio 5:3, texts as references: modern biology - Scott Foresman biology, special topic reports, short field trips, films & videos approximately 2-3 monthly. Emphasis on scientific knowledge, methods and life applications - standard an self generated worksheets - self generated test - current issue topics & computer activities
         c. Chemistry & Physics - Lecture and inquiry lab format - ratio 3:2. Use of modern chemistry - modern physics texts - some standard labs and worksheets - others self generated - all tests self generated use of current topics for lecture & lab applications - emphasis on knowledge enhancemet and strong lab skills - term papers on approved topics
      4. Basic Educational Philosophy - "science is alive & interesting" development of student skills and perceptions of science as an interesting, enjoyable and integral ongoing part of their lives now and for the rest of their lives - man and science are inseparable
      5. Training and Experience - classroom teaching, starting the 8th year - full certification in all science plus lower level math and social studies - student teaching under two recognized outstanding teachers in Biology.
      6. Professional Strength & Weakness
         a. Strength - strong varied training in all science areas and use of multidisciplinary applications to give strong relevance to topic matter in live applications
         b. Weakness - lack of sufficient time for multiple laboratory preparations of for evolution and evaluation of material and preparation of new and innovative presentations - creates overextension of self which can be detrimental to needed energy levels for effective teaching - need to do more delegating to top students who are able to handle some of these things.

II. Organizational Content
- A. Structure
  1. 3 school plan: K-4, 5-8, 9-12
  2. 3 Principals, 1 superintendant, school board, strong community influence on teachers and programs
  3. 3 schools work well in local professional education organization otherwise all function fairly separate from each other with some conflicts
  4. Staff in each school gets along well, socializes some but are autonomous at the 5-8 & 9-12 levels - increasing from grade to grade
- B. Decision Making - district issues final decision rests with school board, strong community input lesser from administration and teachers - strong social influence by some factions in the community - classroom, curriculum and format decision at the high school level are mostly made by the indivdual teachers
- C. People - teachers basically work well together - some collaboration on students - support system fairly good - some undercurrent of internal disputes between few teachers - teachers in individual departments are fairly autonomous in subject area relations
- D. Influences - changes can be instigated and adapted if other teachers and community can see purpose - school change is not feared but is integrated guardedly - changes that play a role in agriculture or athletic or industry related programs are best received - basic community attitude is conservative with a few active factions
- E. Organizational Assessment - organization & community
  a. weakness - initial resistance to change or information disseminated on change
  b. strength - strong united form to develop new programs that the community feels relevant - most individual subject area changes occur at the teacher level with very limited outside input.

III. Analysis of the Proposed Change of Innovation
- A. Description of proposed changes
  1. Set up resource center for K-12, including information packets, activities, special topic presentations
  2. Coordinate goals and objectives 9-12
  3. Set up science outreach program
  4. Speakers brought in to present current science information to student body
- B. Implementation of Changes
  1. Resource center to be set up in Elementary media area - including resource books, information packets, short science activities on activity cards
  2. To coordinate goals and objectives utilize working sessions to assess and improve plans, goals and objectives for each topic area taught -- stress interdisciplinary approach to strengthen all areas
  3. Science outreach -- use advanced science students to write, plan and coordinate classroom experiments and demonstrations for

elementary classes -- use Chemistry Discovery type presentation for large groups -- also produce card catalog of short inquiry labs and demonstrations for teachers at K-6 to use on their own

4. Speakers -- plan at least one speaker to speak to school body on a current topic in science stress on science's role in the future

C. Personal Role - facilitator to organize and coordinate all activities - set up program so it will be a continum in the future - plan second coordinator.

D. Applications - the program will be applicable to K-12 program and will implement present areas that need the additional science information and stimulus.

E. Workability - proposed changes are well within the scope of accomplishment with a minimum of conflict

F. Benefits - costs - as proposed the implementation of the program will be a minimal cost - only real expense will be for an outside speaker each year, benefits will far outstrip this small cost.

G. Personal Professional Costs - properly implemented this will be a payback not a cost - as it will stimulate rather than inhibit total capacity and input - properly set up my load should not be increased.

IV. Implementation Plan

A. Factors to consider -- all proposed alterations will be a direct positive correlation to community interest and involvement - other teachers involved will be positive in attitude by using the student facilitator approach

B. Participation - all involved should be active participants due to cross section involvement from K-12.

C. Resources - pool resource from present school material add resorces from college, libraries, NASA, DOE, etc. Coordinate topics so the resources available will be easy to find

D. Assistance - utilization of administrators to spread the word and allow me to set up a brief demo and introduction of the progam to the elementary teachers and help them get involved personally

E. Evaluation - to be acomplished by a survey in the spring which will serve as an assessment tool of the program so that the program can be altered or improved upon - also the survey will be multi-fold - drawing on students K-12 and teachers input

F. Time Line - the program is planned for and initial one year time frame renewable yearly basic proposed line

Sept. 1985: set up student facilitators

Oct., 1985-
Dec., 1986: train student facilitators
finish program and activity cards in the resource center.

Jan., 1986: revamp of goals and objectives in the high school science area - plan changes for 86-87 school year.

Jan., 1986: put science outreach program into effect utilizing student facilitators at teachers request for specific topic demos.

Mar., 1986-
Apr., 1986: Plan for a high interest topic speaker for a school presentation

May, 1986: Plan and implement survey tool so needs and goals may be planned for the upcoming year - also plan involvement of a second coordinator so the program can be a continum regardless of availability of only one person.